

A TAXONOMIC STUDY OF THE GENUS *CERATOGRAMMA*
(HYMENOPTERA: TRICHOGRAMMATIDAE)

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Abstract.—The genus *Ceratogramma* De Santis is reviewed. The group is known from Central and South America, and the West Indies. Six species are recognized including four described as new. The new species are *C. masneri* Pinto and Viggiani, *C. magnificum* Pinto and Viggiani, *C. robustum* Pinto, and *C. brasiliense* Viggiani. Antennal and genitalic characters distinguish *Ceratogramma* from other trichogrammatid genera. A key to species and a discussion of species relationships are included.

Key Words: Hymenoptera, Trichogrammatidae, *Ceratogramma* taxonomy

Ceratogramma was described by De Santis (1957) for *C. schachovskoyi* from Argentina. The genus was known only by the male holotype of this species for over 30 years. A second species, *C. etiennei*, a parasite of the eggs of *Diaprepes abbreviatus* L. (Col.: Curculionidae) on the West Indian island of Guadeloupe, was recently added by Delvare (1988). Recent collections from Central and South America have revealed four additional species of *Ceratogramma*. These are described below. A key to the known species and a discussion of their relationships are included.

Terminology employed in this paper follows Doult and Viggiani (1968) for wing venation and vein tracks, Viggiani (1971) for male genitalia, and Scudder (1961) for ovipositor structure. Specimens examined currently are deposited in the following institutions: British Museum of Natural History, London (BMNH); Canadian National Collection, Ottawa (CNC); Museum of Natural History, Paris (MNHP); National Biodiversity Institute, Costa Rica (INB); National University of La Plata, Argentina (UNLP); University of California, River-

side (UCR); University of Naples, Portici (UNP); and the United States National Museum, Washington, D.C. (USNM).

Ceratogramma De Santis

Ceratogramma De Santis, 1957: 11. Doult & Viggiani, 1968: 484, 524. Viggiani, 1971: 213. [Type species: *Ceratogramma schachovskoyi* De Santis (1957), by original designation.]

Characteristics.—Ranging from 0.5–1.4 mm in length. Antenna (Figs. 5–10) with three anelli (A), two distinctly separated funicle (F) segments, and a three-segmented club (C); a small fourth club segment in males present or not. Mandible strongly tridentate. Maxillary palp two segmented, with an elongate sensory appendix at apex of segment II. Fore wing (Figs. 11–16) with disk densely setate, distinct setal tracks absent or reduced in number; subcostal vein bearing two setae; marginal vein distinctly differentiated from premarginal and, usually, from stigmal vein; premarginal vein enlarged at base; stigmal vein relatively elongate, moderately constricted at base; a short

postmarginal vein present or not; radial process at base of premarginal vein developed or not. Hind wing (Fig. 17) with two anterior setal tracks extending from apex of venation to apex of wing. Mesoscutum and scutellum (Figs. 1, 2) each with two pair of setae; axillae exceeding base of scutellum, with one seta. Male genitalia (Figs. 18, 19) with gonostyli, volsellae and intervolsellar process present, the latter extremely well developed, attaining or extending beyond the gonostyli and volsellae; aedeagus not fused to genital capsule.

Relationships.—*Ceratogramma* is placed in the Trichogrammatini by Viggiani (1971) based on male genitalia. The genus is most similar phenetically to the European *Szelenyia* (see Doult and Viggiani 1968). The maxillary palpi are two segmented in both, and basic antennal and wing structure is similar also. Specifics of wing venation and shape, antennal segmentation, and male genitalia distinguish the two. In *Szelenyia* the wing is broadly oblate distally and the short marginal vein is more abruptly delimited from both the premarginal and stigmal veins. In *Ceratogramma* the fore wing is narrower and the transition from the marginal to the stigmal and premarginal veins is more gradual. The anellus is only two segmented in *Szelenyia* as in other Trichogrammatidae. Genitalic structure is similar in both but *Szelenyia* lacks the intervolsellar process (Viggiani 1984), a prominent feature in *Ceratogramma*. *Ceratogramma* also shows similarity to *Mirufens*, particularly in palpal structure, the sexually dimorphic antenna of some of its species, genitalic structure, and the basically similar wing venation. The extremely elongate intervolsellar process and three-segmented anellus are two presumably derived characters that distinguish *Ceratogramma* from all other genera.

- Fore wing not pictured (Fig. 12), at most slightly fumate at base. Funicle segments more elongate, F2 as long as or longer than wide (Figs. 7-10) 3
- 2. Scape greatly bulged anteriorly in both sexes, its width subequal to length of pedicel (Fig. 5) *masneri*
- Scape not as noticeably bulged in either sex, its width less than pedicel length (Fig. 6) *robustum*
- 3. Tarsomere I of middle leg elongate, longer than II and III combined (Fig. 2), also longer than tarsomere I of hind leg. Ovipositor extremely elongate, extending far beyond apex of gaster (Fig. 2), gonoplags comprising almost half the entire length of ovipositor *magnificum*
- Tarsomere I of middle leg much shorter, subequal in length to II, also subequal in length to I of hind leg. Ovipositor much shorter, at most barely extending beyond apex of gaster; gonoplags comprising 1/3 or less the entire length of ovipositor (Fig. 20) 4
- 4. Female antenna (Fig. 8) with F1 longer than wide, about 1 1/2 as long as wide. Fore wing with marginal vein about 1/3 length of premarginal vein (Fig. 15); vein tracks RS₂ and r-m indistinct. Male scape broad, inflated, width greater than half its length and subequal to length of pedicel *schachovskoyi*
- Female antenna (Fig. 9) with F1 not longer than wide. Marginal vein about as long as premarginal vein; vein tracks RS₂ and r-m distinct (Fig. 12). Male scape narrow, not inflated (Fig. 10) 5
- 5. Female antenna with F1 subquadrate, about 3/4 the length of F2. Fore wing not oblatly rounded apically, ca. 2.1 as long as wide. Gonoplags short, 1/8-1/10 entire length of ovipositor. Hind tibia brown; gaster orange. Male genitalia with a distinct ventral protuberance at base of each gonostylus *etiennei*
- Female antenna (Fig. 9) with F1 transverse, about 1/2 the length of F2. Fore wing oblatly rounded apically (Fig. 12), 1.8 as long as wide. Gonoplags longer, 1/5 entire length of ovipositor (Fig. 20). Hind tibia yellow; gaster with apical segments brown. Male genitalia without a ventral protuberance at base of each gonostylus (Fig. 19) *brasiliense*

KEY TO THE SPECIES OF
CERATOGRAMMA

- 1. Fore wing pictured (Fig. 11). Funicle segments broad, F2 transverse, more than twice as wide as long (Figs. 5, 6) 2

Ceratogramma masneri Pinto & Viggiani,
NEW SPECIES

The description of *C. masneri* is based primarily on the slide-mounted holotype and allotype. Exceptions are body length and shape, characterization of the head capsule,

and color, taken from critical point dried specimens mounted on cards.

Diagnosis.—Shape compact, robust (Fig. 1). Antenna not sexually dimorphic, setation pattern and number of club segments similar in both sexes; scape strongly expanded; F2 transverse. Fore wing pictured; without postmarginal vein. Mesoscutum evenly rounded dorsally; scutellum tentiform in posterior half only. Ovipositor exerted.

Length: Female 0.82–0.90 mm ($n = 2$) (0.70–0.80 mm excluding ovipositor); male 0.58–0.65 mm ($n = 7$). Gaster subequal in length to thorax.

Color: Thorax dark brown, shiny, with slight metallic luster; head and gaster yellow brown; the latter darker, often suffused with brown laterally and along margins. Legs light to dark brown except apex of tibiae yellow; femora also usually lighter at apex. Eyes and ocelli red. Antenna with scape yellow to light brown except brown at anterior margin, distinctly lighter than apical segments. Fore wing pictured (Fig. 11), fumate with hyaline areas as follows: extending obliquely from premarginal vein to hind margin of wing, posterior to subcostal vein, anterior to premarginal vein, and extending in arcuate fashion across apical fifth of wing; fumate areas darkest at basal $\frac{1}{5}$.

Female.—**Head** (Fig. 3): 0.86 as long as wide; scrobes relatively shallow, extending only half distance from toruli to median ocellus; vertex broad, relatively flat, abruptly perpendicular to face; narrowest interocular space 0.45–0.50 greatest head width. Antenna (Fig. 5) arising at level of ventral margin of eye; relative length of scape, pedicel, two funicular segments and club 31:14:(7:4):33, respectively; scape expanded, bulged on anterior surface, 0.42 as wide as long, width subequal to pedicel length; F1 asymmetrical, slightly wider than long; F2 transverse, about three times wider than long; each funicle with a linearly obovate basiconic peg sensillum (BCPS) at apex, and a single, elongate placoid sensillum extending obliquely from base of segment to slight-

ly beyond apex; club moderately densely setate, three segmented, ca. 1.3 as wide as funicle, relative length of segments 20:23:16, C1 and C2 subequal in width, subrectangular in outline, slightly narrower than long and not noticeably tapered apically, C3 subconical, slightly wider than long; club with a single subapical BCPS and 4, 5, and 4 linear placoids on C1–3, resp., each placoid extending at least slightly beyond apex of segment; C3 with several thin-walled setiform sensilla and an elongate, subconical sensillum at apex. Maxillary palp relatively short, segments subequal in length, I distinctly broader than II, sensory appendix on II longer than segment itself.

Thorax: Mesoscutum and scutellum (Fig. 1) smooth, obsolescently reticulate, each with two pair of elongate, spiniform setae; side lobe of scutum with a single seta at lateral margin; axilla with a seta near center; mesoscutum evenly convex; scutellum large, 0.81 as long as wide, with posterior margin angular, projecting posteriorly, disk slightly to moderately tentiform, usually in posterior half only (not discernible in Fig. 1). Fore wing (Fig. 11) 0.55 as wide as long, venation attaining 0.60 length of wing; with rather scattered setation, densest at center of disk; fringe setae relatively elongate, 0.17 maximum wing width; basal vein track absent; radial process absent; length of premarginal, marginal and stigmal veins, 23:28:17, resp.; postmarginal vein absent; marginal vein curving gradually and evenly to stigmal vein, narrowing abruptly basally to premarginal vein; stigmal vein gradually increasing in width to apex; costal cell relatively broad, truncate apically, with 2–3 setae near margin. Hind wing relatively broad at hamuli, immediately tapering to apex, with two setal tracks extending from apex of venation to apex of wing, also with a track immediately behind venation and another extending along posterior margin, and 10 additional scattered setae. Legs with relative length of coxa, trochanter, femur, tibia and (tarsomeres) as follows: fore leg—29:14:45:40:(8:10:13); middle leg—22:18:37:58:(19:11:13);

hind leg—36:24:55:64:(15:12:14); relative length of fore, middle and hind tibial spurs 6, 7, and 7, resp.

Gaster: Ovipositor elongate, occupying entire gaster, apical $\frac{1}{3}$ extending beyond apex of gaster (Fig. 1); extended portion of ovipositor curved dorsally, apex at same level as dorsum of gaster; length 2.2 hind tibial length, gonoplacs occupying $\frac{1}{3}$ ovipositor length; basal 0.17 of ovipositor extending anterior of gonangulae. Hypogynium short, extending only slightly beyond middle of gaster.

Male.—Similar to female except as follows: Antennal club less densely setate, shorter relative to scape ($\frac{3}{4}$ as long); funicular segments lacking linear placoid sensilla; with 1, 2, and 2 placoids on C1–3, resp. Genital capsule (Fig. 18) elongate, 0.30 as wide as long; aedeagus 1.15 and 0.78 length of genital capsule and hind tibia, resp.; gonostyli narrow, each with a single seta (or 2?) apically; volsellae with two robust spurs apically, attaining level of gonostyli; inter-vosellar process elongate, extending well beyond gonostyli and volsellae.

Type information.—Holotype female, COSTA RICA: Alajuela, Peñas Blancas, 700 m, 9-iv/9-v-1987, "primary rain forest, malaise trap," E. Cruz (CNC). Allotype, COSTA RICA: San Jose, Braulio Carillo Natl. Pk., ca. 400 m, "sweeping lowland rain forest," 10-iv-1985, L. Masner (CNC). Both types are on slides, mounted in Canada balsam.

Variation.—There are either two or three setae near the margin of the costal cell. In the holotype the number differs on each wing. The radial process of the fore wing is visible in the holotype but appears to be absent or obsolescent in other slide-mounted specimens.

The single female from the Dominican Republic (see Records) is tentatively assigned to this species. It differs from typical *C. masneri* in several minor details—costal cell setae are absent; segment II of the maxillary palp is slightly longer and broader;

and, the anterior surface of the scape is broadly concave at its apical third, not relatively straight as in Fig. 5.

Records.—18 ♀♀, 11 ♂♂. COSTA RICA: Braulio Carillo Natl. Pk. (series of allotype, see above), 4 ♂♂ (CNC, UCR). Braulio Carillo Natl. Pk., 1000 m, x/xi-1989, 1 ♀, P. Hanson (UCR). Bribri (4 km NE), 50 m, ix/xi-1989, 1 ♀, P. Hanson (UCR). Carara Biol. Reserve, 500 m, x-1989, 2 ♀♀ (UCR). Golfo Dulce, Rincon de Osa (3 km SW), 10 m, malaise trap, ix/xi-1989, 3 ♀♀ & 1 ♂, P. Hanson (INB, UCR). Guapiles (16 km W), 400 m, malaise trap, viii/ix & xii-1989, 2 ♀♀, P. Hanson (UCR). Manuel Antonio Natl. Pk., 23/28-viii-1986, 5 ♂♂, L. Masner (UCR, UNP). Monteverde, St. Luis Valley, 1400 m, "screen sweeping semi-disturbed area," 17-viii-1986, 1 ♀, L. Masner (UCR). Peñas Blancas, 1 ♀ (holotype, see above). Tortuguero Natl. Pk., 0 m, iv/viii-1989, 4 ♀♀, J. Solano (INB, UCR). Zurqui de Moravia, 1605 m, malaise trap, xii-1989, 1 ♀, P. Hanson (UCR). DOMINICAN REPUBLIC: Pedernales, Los Arroyos (3.5 km N), 1450 m, 16/18-vii-1990, sweeping, 1 ♀, L. Masner (UCR). ECUADOR: Pichincha, Tinlandia, "lower montane rain forest," 9/13-v-1987, 1 ♂, L. Coote & B. Brown (UCR). VENEZUELA: Aragua, Rancho Grande, 1150 m, 4-vii/9-viii-1986, 1 ♀, B. Gill (UCR).

Etymology.—This species is named for Dr. Lubomir Masner of the Canadian National Collection, a frequent collector of this species as well as of numerous other Trichogrammatidae from throughout the world.

Notes.—The expanded scape is characteristic of both sexes. In *C. schachovskoyi*, a similar modification apparently is limited to males only. *C. masneri* is closely related to *C. robustum*. The two are compared below.

Ceratogramma robustum Pinto, NEW SPECIES

The following description is based primarily on the slide-mounted holotype and

allotype. Exceptions are female body length and shape, characterization of the female head capsule, and color, taken from the two critical point dried paratype females mounted on cards.

Diagnosis.—Distinguishing traits as in *C. masneri* except scape not strongly expanded (cf. Figs. 5, 6) and scutellum tentiform along entire dorsal surface. Specifics differing from *C. masneri* as follows.

Length: Female 0.98–1.00 mm (0.70–0.80 mm excluding ovipositor) ($n = 2$). Male 0.50 mm ($n = 1$).

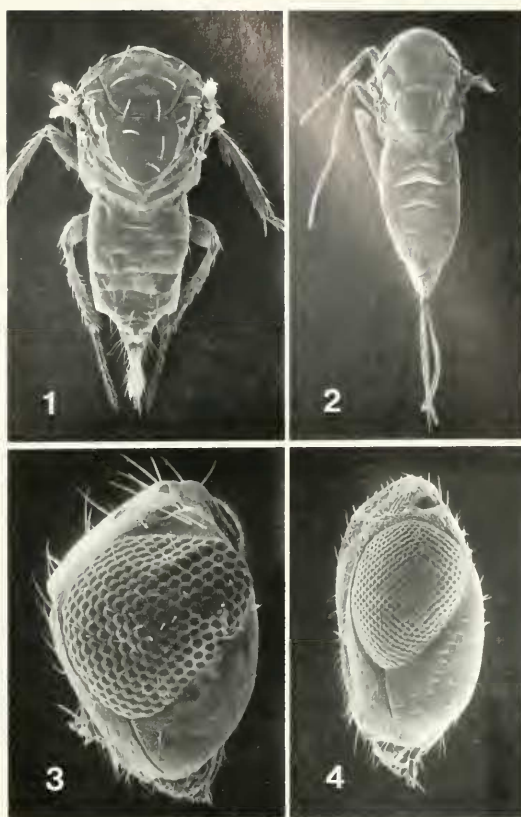
Color: Darker; head dark brown, only slightly lighter than dorsum of thorax; gaster brown.

Female.—**Head** 0.84 as long as wide, narrowest interocular distance 0.40 greatest head width. Eye more distinctly bulged. Antenna (Fig. 6) with scape widest at middle but not as bulged anteriorly, only 0.30 as wide as long; club slightly broader and more ovate; setation longer, denser. Fore wing (Fig. 13) with costal cell more setose; stigmal vein somewhat angled to marginal vein; base of marginal vein broader, subtriangular, gradually narrowing to, and not as distinct from, premarginal vein; radial process absent. Maxillary palp with segments I and II subequal in length, II slightly narrower, its apex with two setae and an elongate sensory appendix; appendix ca. $\frac{3}{4}$ length of segment; longer seta subequal to length of segment.

Thorax: Scutellum, metanotum and propodeum distinctly tentiform, subcarinate. Legs with relative length of coxa, trochanter, femur, tibia and (tarsomeres) as follows: fore leg—30:16:45:40:(8:9:11); middle leg—27:18:45:59:(19:11:13); hind leg—32:22:56:62:(11:12:15); tibial spurs 5:5:13, resp.

Gaster: Ovipositor only slightly curved dorsally, slightly longer, length 2.26 that of hind tibia; gonoplocs occupying 0.35 ovipositor length; basal 0.10 of ovipositor extending anterior of gonangulae.

Male.—**Head** 0.74 as wide as long, interocular space 0.50 greatest head width.



Figs. 1–4. 1, *Ceratogramma masneri* (dorsal of thorax and gaster, female, 73 \times). 2, *Ceratogramma magnificum* (same, 29 \times). 3, *Ceratogramma masneri* (lateral of head, female, 173 \times). 4, *Ceratogramma magnificum* (same, 86 \times).

Type information.—Holotype female, ECUADOR: Pichincha, Rio Palenque Research Station, flight intercept trap, vi/viii-1985, S. & J. Peck [slide mounted in Canada balsam (CNC)]. Two female paratypes (on card) with same data as type (UCR). Allotype (on slide) from same locale except 1/4-v-1987, L. Coote & B. Brown (UCR).

Records.—3 ♀♀, 1 ♂. ECUADOR: Pichincha, Rio Palenque Research Station, vi/viii-1985, 3 ♀♀, S. & J. Peck (CNC, UCR). Rio Palenque Research Station, “lowland rain forest, screen sweeping,” 1/4-v-1987, 1 ♂, L. Coote & B. Brown (UCR).

Notes.—Both *C. robustum* and *C. mas-*

neri have been collected at the Rio Palenque Research Station in Ecuador.

Ceratogramma magnificentum
Pinto & Viggiani,
NEW SPECIES

The description of this species is based primarily on the slide-mounted holotype. Exceptions are body length and shape, characterization of the head capsule, and color, taken from critical point dried specimens mounted on cards.

Diagnosis.—Shape elongate, moderately slender (Fig. 2). Antenna (Fig. 7) with funicle segments elongate; scape not expanded. Wing (Fig. 14) not pictured, with a postmarginal vein. Ovipositor extremely long, extending far beyond apex of gaster, straight, not curved dorsally. Gaster slightly longer than thorax; gaster evenly tapering to apex, not bluntly rounded as in other species.

Length: 1.9 (1.8–2.0) mm ($n = 5$) including exerted ovipositor; 1.3 (1.2–1.4) mm excluding ovipositor.

Color: Primarily dark brown to almost black; gaster slightly lighter than thorax; head above toruli and between eyes lighter brown; eyes red; scape yellow to light brown; legs primarily dark brown except apex of mid and hind tibiae, tarsi and much of fore tibia yellow.

Female.—**Head** (Fig. 4) 0.94 as long as wide; scrobes deep, well defined, extending to median ocellus; vertex narrow, not perpendicular to face; interocular distance 0.53 maximum head width. Eye relatively small, malar space 0.42 lateral head length; toruli slightly below lower margin of eyes. Antenna (Fig. 7) with relative length of scape, pedicel, two funicular segments and club—44:22:(18:17):43; scape linear, not even slightly produced anteriorly, 0.18 as wide as long; pedicel with well-developed reticulate sculpturing on external surface; anelli distinct, A1 slightly shorter than A2 and A3; F1 elongate, linear, 0.48 as wide as long, F2 slightly shorter and wider, 0.63 as wide as long; club fusiform, 1.31 as wide as funicle,

widest near center, C1, C2 subequal in length and width, C3 conical, only slightly shorter than and 0.71 as wide as C2; funicular segments and C1 each with 2 BCPS near apex; 1 BCPS present subapically on C3; BCPS apparently absent on C2; 4 and 5 linear placoid sensilla on F1, F2, resp.; 5, 6, and 4 placoids on C1–3, resp., each placoid extending ca. $\frac{3}{4}$ segment length and extending slightly beyond apex of segment. Maxillary palp with segment II shorter and slightly narrower than I, apical sensory appendix 0.78 length of II.

Thorax evenly convex throughout, not tentiform, surface reticulate; mesoscutum and scutellum each with 2 pair of elongate setae, posterior pair on scutellum at posterior margin; scutellum 0.85 as long as wide, posterior margin broadly arcuate; side lobe of mesoscutum with a single seta at lateral margin; axilla with a single seta near medial margin. Fore wing (Fig. 14) 0.48 as wide as long, densely setate, setae densest at center, venation attaining 0.53 length of wing; very short postmarginal vein present; length of subcostal, premarginal, marginal, postmarginal and stigmal veins—63:42:40:5:19; short basal vein track of 3 setae; a non-setate area present immediately behind venation; costal cell moderately densely setate; fringe setae short, longest seta 0.07 maximum wing width. Hind wing broad, with two well-defined vein tracks from apex of venation to apex of wing and one track present immediately behind venation; disk posterior to venation densely, irregularly setate; longest fringe seta 0.40 greatest wing width. Legs with relative length of coxa, trochanter, femur, tibia and (tarsomeres) as follows: fore leg—31:21:71:64:(20:16:16); middle leg—30:26:67:98:(41:16:16); hind leg—63:27:74:100:(37:19:18); relative length of tibial spurs, 13, 16, 16, resp.; tarsomeres slender, I of middle leg elongate, longer than II and III combined, and longer than I of hind leg.

Gaster: Ovipositor straight, extremely robust and elongate, 3.45 length of hind tibia, extending considerably beyond gaster (Fig.

2) but not anteriorly under thorax; basal 0.15 of ovipositor extending anterior of large transverse gonangulae; gonoplasts densely setate, elongate, comprising half entire ovipositor length.

Male.—Unknown.

Type information.—Holotype female, CHILE: Cautin, Conguillio Natl. Pk., 1150 m, screen sweeping, 4-ii-1988, L. Masner (CNC). Four female paratypes, same locale, date and collector but collected in pan and malaise traps (UCR, UNP). Holotype and 2 female paratypes on slides in Canada balsam; 2 paratypes on cards.

Records.—13 ♀♀. CHILE: Cautin, Conguillio Natl. Pk., 4 ♀♀ (type series, see above). Nuble, Chillan (72 km SE), 1700 m, “*Nothofagus* forest,” 6-xii-1984/19-ii-1985, 2 ♀♀, S. & J. Peck (UCR). Nuble, Recinto (19.5 km ESE), 1250 m, 10-xii-1982/3-i-1983, 1 ♀, A. Newton & M. Thayer (UCR). Malleco, Curacautin (40 km W), “*Nothofagus-Araucaria*,” 12-ix-1984/16-ii-1985, 1 ♀, S. & J. Peck (UCR). Malleco, Malacahuello (14 km E), 1570 m, “*Nothofagus pumilo-Araucaria*,” 13/31-xii-1982, 2 ♀♀, A. Newton & M. Thayer (CNC). Malacahuello (12 km E), 1350 m, “*Nothofagus-dombey, Araucaria* forest,” 13/31-xii-1982, 1 ♀, A. Newton & M. Thayer (CNC). Osorno, Puyehuya Natl. Pk., Anticura, 250 m, “*Nothofagus* forest,” 12-ii-1988, 1 ♀, L. Masner (CNC).

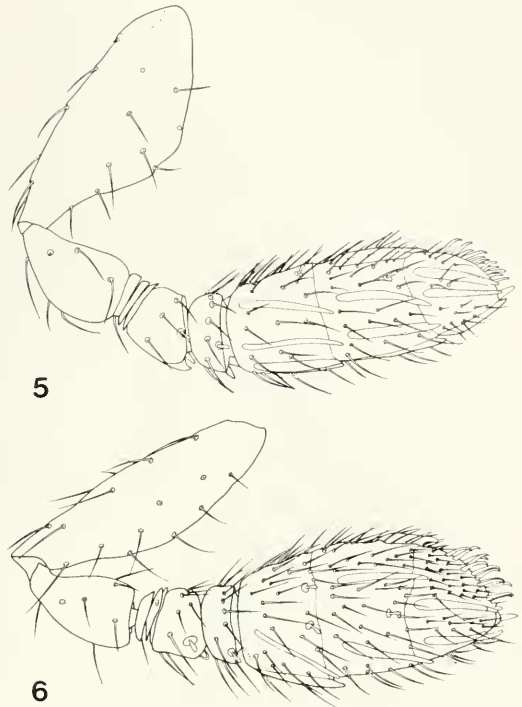
Ceratogramma etiennei Delvare

Ceratogramma etiennei Delvare, 1988: 1.

Diagnosis.—Moderately elongate. Color unique—gaster orange, head and thorax primarily brown, legs yellow except hind tibia brown. Antenna sexually dimorphic, male with whorls of long setae on segments beyond anelli and with a small fourth club segment apically; scape not expanded in either sex. Fore wing not pictured, postmarginal vein present. Ovipositor not exerted.

Length: 0.8–0.9 mm.

Color: Head and most of thorax primarily dark brown; metanotum and propodeum

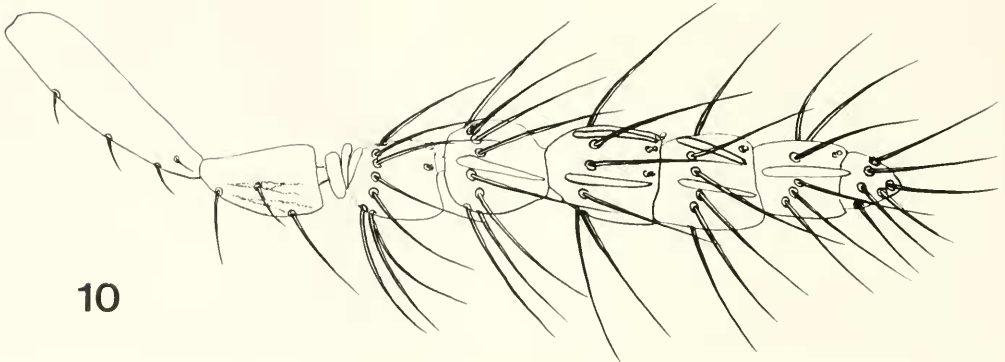
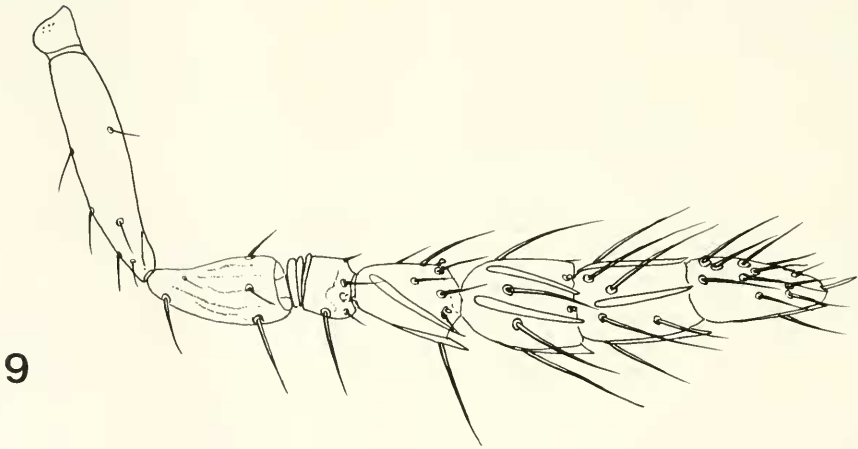
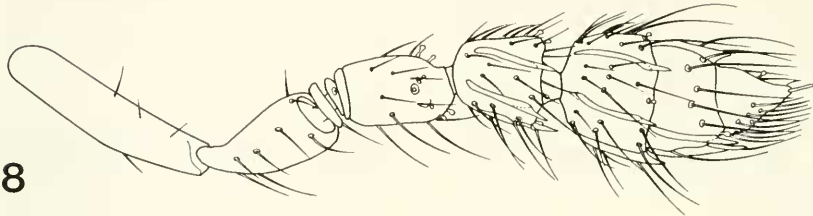
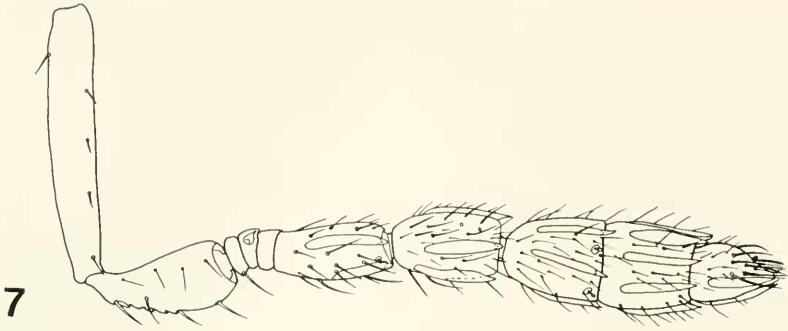


Figs. 5, 6. Female antennae of *Ceratogramma*. 5, *C. masneri*. 6, *C. robustum*.

yellow; legs yellow except hind tibia brown; gaster orange. Antenna light brown except scape and pedicel yellow.

Female.—Head: Antenna relatively short; three anelli, A2 and A3 extremely short, subdiscoidal; funicular segments slightly wider than long, F2 broader and longer than F1. Maxillary palp with segment II slightly shorter and distinctly narrower than I, sensory appendix subequal to length of II.

Thorax evenly convex; scutellum with posterior margin broadly arcuate; mesoscutal and scutellar setae moderately long, length of posterior pair on scutellum ca. 0.4 scutellar length. Fore wing (Fig. 15) similar to *C. magnificum* except somewhat less densely setate; postmarginal vein longer; costal cell with relatively few setae behind margin; basal vein track with 2 setae. Hind wing narrower than in most species (except *brasiliense*) but setal tracks similar in number and position. Legs with tarsomere I of



middle leg subequal in length to II and III, and to I of hind leg; mesotibial spur subequal to length of tarsomere I.

Gaster: Ovipositor short, not extending beyond apex of gaster, occupying 0.8 length of gaster, 1.6 the length of hind tibia; gonopods short, their length only $\frac{1}{8}$ – $\frac{1}{10}$ entire ovipositor length.

Male.—*Genitalia* with a distinct ventral protuberance at base of each gonostylus; narrow gonostyli considerably shorter than volsellae, each with an elongate seta at apex which attains apex of volsellae; genital capsule abruptly narrower at apical half.

Type information.—Holotype female, GUADELOUPE: Neuf-Chateau, ex. egg of *Diaprepes abbreviatus* on *Citrus aurantifolia* (Christm.) Swingle, 4/5-ix-1986, R. Hugon (MNHP), not examined. 4 paratypes (2 of each sex), GUADELOUPE: Sainte-Rose, 13-vi-1986, J. Etienne (USNM), examined. Several additional unexamined paratypes from Neuf-Chateau and Sainte-Rose deposited in MNHP.

Records.—GUADELOUPE: Capesterre, 10-iii-1988, 1 ♀, J. Etienne (UCR). Neuf-Chateau and Sainte-Rose (type series, see above). All specimens reared from *D. abbreviatus*.

Notes.—A3 is very short and closely appressed to F1 in *C. etiennei*. This segment was apparently overlooked by Delvare (1988) when he reported only two anelli in this species.

This species is fully illustrated in Delvare (1988).

Ceratogramma brasiliense Viggiani, NEW SPECIES

The description of this species is based primarily on the holotype female and allotype male. All four specimens known are

slide-mounted. Body length is taken from the entire series.

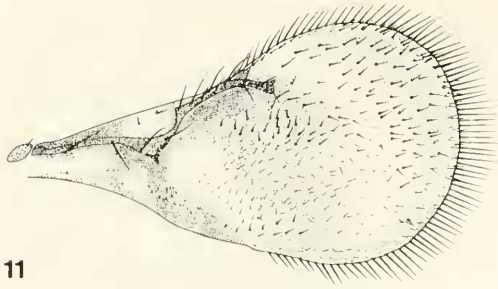
Diagnosis.—Distinguishing traits as in *C. etiennei* except hind tibia entirely yellow; gastral tergites III–VII increasingly brown; scape, F1 and club narrower; fore wing wider apically, rather oblatly rounded; gonopods longer; and male genitalia without a distinct ventral protuberance at base of each gonostylus.

Length: 0.76–0.95 mm.

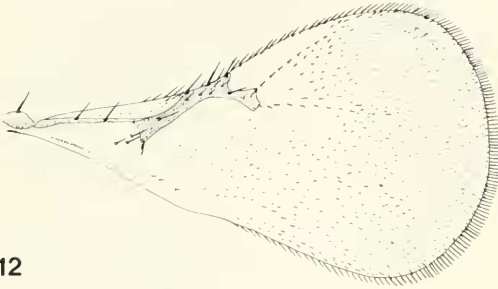
Color: Head and thorax dark brown, including metanotum and propodeum; gaster with tergites III–VII brown; antenna light brown; wing hyaline, only slightly fumate at base; legs yellow with brown coxae; male with more brown on gaster and femora of all legs.

Female.—*Head*: Maxillary and labial palpi as in *C. etiennei*. Antenna (Fig. 9) moderately long; scape rather narrow, 1.6 as long as pedicel; F1 transverse; F2 1.2 longer than wide; club about 4 times as long as wide, C1 and C2 slightly longer than wide or as long as wide; number of campaniform (= BCPS) and linear placoid sensilla distributed as follows: F1 (3, 0), F2 (4–5, 4–5), C1 (4, 6), C2 (1, 5), C3 (0, 3).

Thorax very similar to *C. etiennei*. Fore wing (Fig. 12) 1.8 as long as wide; costal cell about 9 times as long as wide, with a few setae near margin at apical third and a row of setae immediately anterior to venation; relative length of subcostal, premarginal, marginal, postmarginal, and stigmal veins, 20:12:11:2:8, resp.; disk large, setose with RS₂, r-m, CU₂, and A vein tracks distinct; fringe very short, about a third as long as stigmal vein. Hind wing (Fig. 17) rather narrow as in *C. etiennei*, with one setal track behind venation, two tracks extending from hamuli to apex of wing, another along the



11



12

Figs. 11, 12. Fore wings of *Ceratogramma*. 11, *C. masneri*. 12, *C. brasiliense*.

posterior margin, and with a few scattered setae between tracks. Legs with tibial spur and tarsomere ratios as follows: fore—(4):7:7:7; middle—(8):8:8:8; hind—(4):7:7:7.

Gaster rather short, globular, about 1.2–1.3 as long as thorax, not longer than head and thorax combined; ovipositor exerted at base of gaster, about 1.6 length of hind tibia, not exerted; gonoplacs narrow, $\frac{1}{2}$ the length of entire ovipositor (Fig. 20).

Male.—Color similar to female but with more brown on gaster and legs. Antenna and genitalia (Figs. 10, 19) as in *C. etiennei*, except without ventral protuberance basal to each gonostylus.

Type information.—Holotype female, BRAZIL: Nova Teutonia, ix-1943, F. Plauermann (BMNH). Two female and one male paratypes, same data (BMNH). All material on slides in Canada balsam.

Records.—Known only from type series (see above).

Ceratogramma schachovskoyi De Santis

Ceratogramma schachovskoyi De Santis, 1957: 131. Viggiani, 1971: 189. Delvare, 1988: 1, 3.

This species is known from the male holotype and three tentatively assigned females. The description below refers to the male type. The description of females is separate and, because one is card mounted, includes certain traits (e.g. specifics of head structure) that could not be adequately described from the slide-mounted male.

Diagnosis.—Moderately elongate. Color of head, thorax and gaster brown. Antenna sexually dimorphic; male with expanded scape, whorls of long setae on segments beyond anelli, and a small fourth club segment apically. Fore wing not pictured, with a distinct postmarginal vein. Ovipositor not exerted.

Male (holotype).—*Length*: 0.9 mm.

Color: Brown except coxae in part, basal half of notauli and a medial longitudinal vitta on thorax yellow. Fore wing hyaline except slight fumation at base and near stigmal vein.

Head: Antenna with scape expanded and slightly more than half as wide as long, width of scape subequal to pedicel length; whorls of moderately long setae on all segments beyond anelli; F1, F2 ca. 0.7 and 0.8 as wide as long, resp., their combined length 0.80 club length; club with a small fourth segment. Maxillary palpal segment II elongate, slightly longer than I, apical sensory appendix short, only 0.30 length of II.

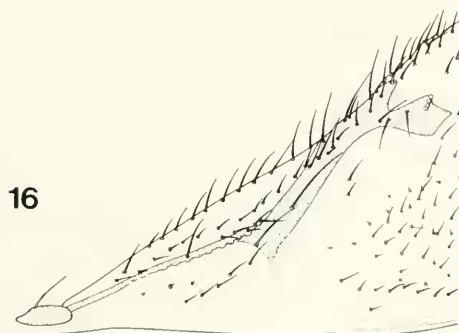
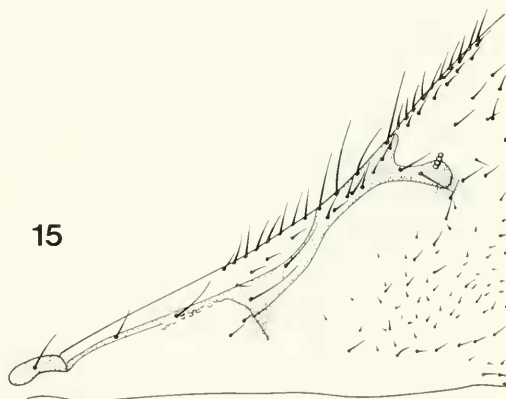
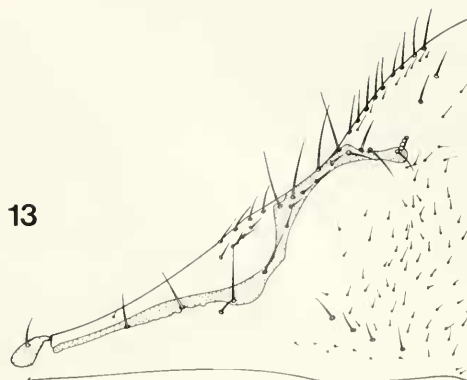
Thorax evenly convex, not tentiform; mesoscutal and scutellar setae extremely long, length of posterior pair on scutellum over half (0.6–0.8) scutellar length. Fore wing venation (Fig. 16) attaining 0.48 length of wing, postmarginal vein present; marginal vein short, 0.6 length of premarginal vein and only slightly longer than stigmal vein; costal cell setate on margin and anterior to venation; basal vein track well developed; disk densely setate, with 2 strong setae in

area immediately posterior to venation, otherwise this area lacking setae as in congeners. Hind wing very broad but not immediately narrowing apically from hamuli as in *C. masneri* and *C. robustum*, width 2.3 length of posterior fringe; vein tracks as in other species except not as distinct because of dense setation throughout disk. Tarsomere I of middle leg subequal in length to II and III, and to I of hind leg; mesotibial spur subequal in length to tarsomere I.

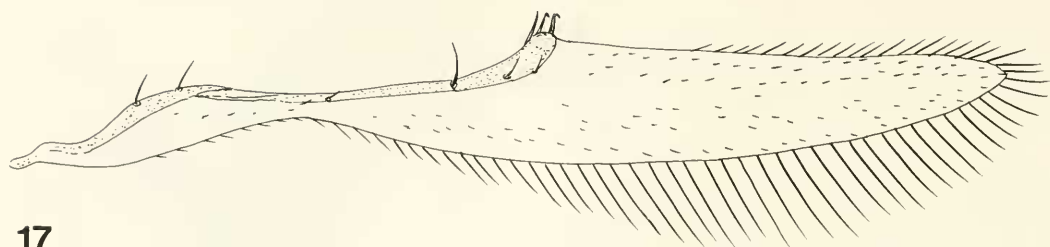
Gaster: Genitalia with a ventral protuberance at base of each gonostylus.

Female.—*Color* dark brown except face, antenna yellow, and fore and middle legs yellow apical to coxa; hind leg with femora primarily dark brown; wing not noticeably fumate, venation light brown.

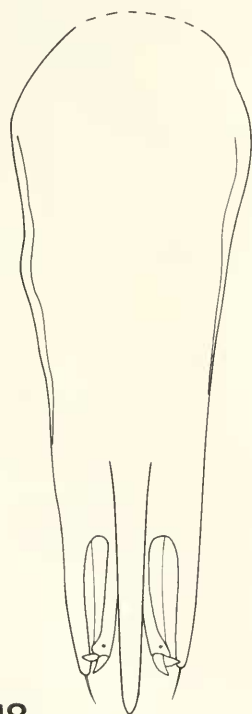
Head broad, 0.74 as long as wide; interocular distance 0.47 maximum head width. Eyes larger than in *C. magnificentum*, bulged, malar space relatively short, occupying $\frac{1}{3}$ lateral head length. Toruli above lower margin of eyes (at ventral fourth); scrobes distinctly shorter than in *C. magnificentum*, extending only $\frac{2}{3}$ distance to median ocellus; vertex broad, subperpendicular to face. Antenna (Fig. 8) with scape linear, not expanded, its width only $\frac{1}{2}$ pedicel length; with moderately elongate setae, setae not whorled as in male; length of scape, pedicel, funicle segments and club—20:12:(10:8):23, resp.; F1 0.70 as wide as long, F2 broader, almost as wide as long; club 1.4 as wide as funicle, broadest at base, tapering to apex; C1, C2 wider than long, C3 slightly longer than wide, with a narrow, elongate sensory appendix apically. Number of linear placoid sensilla distributed on antenna as follows: F1-1, F2-2, C1-5, C2-3, C3-3; funicles, C1 and C2 ringed at apex with several large, subglobose



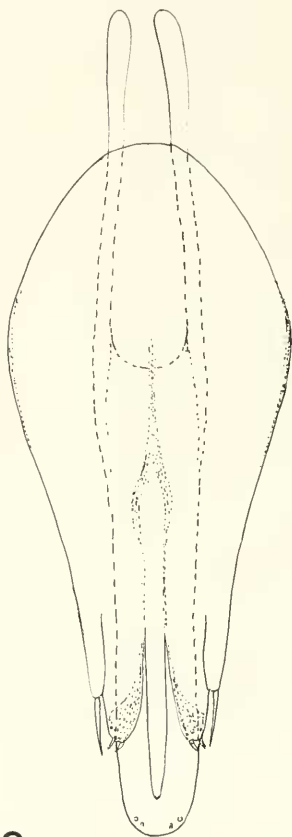
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Figs. 13–16. Fore wings of *Ceratogramma* (basal portion showing venation). 13, *C. robustum*. 14, *C. magnificentum*. 15, *C. etiennei*. 16, *C. schachovskoyi* [a seta on subcostal vein of this specimen (holotype) apparently missing (broken?)].



17



18



19



20

Figs. 17-20. 17, Hind wing of *C. brasiliense*. 18, 19, Male genitalia of *Ceratogramma* (ventral). 18, *C. masneri* (aedeagus removed). 19, *C. brasiliense* (aedeagus in place). 20, Ovipositor (right half) of *C. brasiliense*.

BCPS; C3 with only one subapical BCPS visible.

Gaster: Ovipositor relatively short, length 1.7 that of hind tibia; occupying most of gaster but extending only slightly beyond its apex; gonoplasts short, consisting of only $\frac{1}{8}$ total ovipositor length; only basal 0.12 of

ovipositor extending anterior of small linear gonangulae. Hypogynium extending slightly beyond apical half of gaster.

Type information.—Holotype male, ARGENTINA: Neuquen, "orillas del Lago Curruhe Grande," 25-ii-1955, B. Torres & L. De Santis (UNLP), examined.

Table 1. Characters of species of *Ceratogramma*.

Species	Characters*									
	1	2	3	4	5	6	7	8	9	10
<i>brasiliense</i>	-	+	-	-	+	+	+	-	-	-
<i>etiennei</i>	-	+	-	-	+	+	+	-	-	+
<i>magnificum</i>	-	?	-	-	+	+	+	+	+	?
<i>masneri</i>	+	-	+	+	-	±	-	+	+	-
<i>robustum</i>	+	-	+	+	-	-	-	+	+	-
<i>schachovskoyi</i>	-	+	-	-	+	+	+	-	-	+

* Characters: 1, Anterior margin of scape arcuate in both sexes. 2, Antenna dimorphic sexually: male with a 4-segmented club and whorls of setae on funicle and club. 3, Thorax tentiform at least in part. 4, Fore wings pictured. 5, Distinct postmarginal vein present. 6, Radial process present on fore wing. 7, Basal vein track present on fore wing. 8, Tarsomere I of middle leg elongate, distinctly longer than II or III. 9, Ovipositor exerted, gonoplaes elongate. 10, Male genital capsule with distinct ventral protuberances at base of gonostyli.

Records.—3 ♀♀, 1 ♂. ARGENTINA: Neuquen, Lago Curruhe Grande, 1 ♂ (type, see above). Rio Negro, Puerto Radal, 3-iv-1971, 1 ♀ (UNLP). CHILE: Valdivia, La Union (30 km W), 500 m, “*Nothofagus*,” 7/12-ii-1988, 2 ♀♀, L. Masner (UCR).

Notes.—Males and females of this species have never been collected together. Consequently the three females are tentatively assigned. Similarity of several structures in the four specimens including the wings, legs, color pattern and overall body shape strongly suggests conspecificity. The male antenna of this species is illustrated in De Santis (1957); the male genitalia are illustrated in Viggiani (1971).

C. schachovskoyi and *C. magnificum* may be sympatric.

RELATIONSHIPS

Ten characters and their distribution among the species of *Ceratogramma* are given in Table 1. Statements of relationship relate phenetic similarity because of questionable homologies and character polarity, and the fact that the male of *C. magnificum* is unknown.

Two groups of species are recognized. *C. masneri* and *C. robustum* are very similar. This is indicated by the general shape of the scape, the short and broad funicular segments, thoracic structure, the pictured wings, and the absence of a basal vein track. The

sexually dimorphic antennae and postmarginal vein suggest that *C. etiennei*, *C. brasiliense* and *C. schachovskoyi* are close. Placement of *C. magnificum* is not possible without males. Certain traits in the female of this species are shared with each of the two species assemblages. The postmarginal vein is shared with *C. etiennei*, *C. brasiliense* and *C. schachovskoyi*. As in *C. masneri* and *C. robustum*, however, the ovipositor in *C. magnificum* is strongly exerted, and tarsomere I on the middle leg is elongate. Relationships among *C. etiennei*, *C. brasiliense* and *C. schachovskoyi* also are not clear. *C. etiennei* and *C. brasiliense* are phenetically most similar. Unlike *C. schachovskoyi*, in these two species the male scape is unmodified, the RS₂ and r-m tracks are distinct, Fl is not elongate, and the gaster is light colored, at least in part. The ventral protuberances on the male genitalia, however, is a feature characterizing only *C. schachovskoyi* and *C. etiennei*.

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